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**Note:** This is a Continuation-in-part (CIP) application of prior provisional application number 60/087,745  
filed on 06/02/1998.

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Serial or Patent No.: **60/087,745 (provisional)**  
Filed or Issued: **filed 06/02/1998**

Attorney's  
Docket Number: **1999-00**

For: **APPARATUS AND SYSTEM FOR PROMPT DIGITAL PHOTO DELIVERY AND ARCHIVAL**

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**Andrew Thomas Knowles**

Inventor

Signature of Inventor

Date

*Andrew T. Knowles*  
6/2/99

# APPARATUS AND SYSTEM FOR PROMPT DIGITAL PHOTO DELIVERY AND ARCHIVAL

5

## CROSS REFERENCE TO RELATED APPLICATIONS

This is a Continuation-in-part (CIP) application of provisional application number 60/087,745 filed on 06/02/1998.

## 10 FIELD OF THE INVENTION

The present invention relates to digital cameras and particularly to digital cameras which include a radio frequency (RF) transceiver for transmitting digital photos to a remote destination according to user preferences.

## 15 BACKGROUND OF THE INVENTION

Digital cameras are increasingly popular, which popularity is due in part to their elimination of processing delays involved with conventional film-based photography. With a digital camera, one does not have to shoot an entire roll of film and send it to a processor for development before seeing the resulting photograph. Instead, one can immediately download a digital image to a computer and display the photograph, or in some instances link the digital camera to a TV monitor to display the photograph. Another attractive feature of digital cameras is that the digital images they create, after being stored on a computer, can be forwarded to others via e-mail or can be incorporated into other electronic documents, including Internet web pages.

25 However, the process of connecting the digital camera to a computer and then downloading images to the computer for storage and viewing can be complicated. Some digital camera manufacturers have attempted to make this process easier by including in the camera a standard format 3.5 inch floppy disk drive for storing digital images so that the images can be easily accessed by computers with similar disk drives. Others provide flash card memory which can store a high number of images, or provide an infrared (IR) port for transferring images to a computer.

30 Even with these features, the image transfer cannot be begun until the digital camera (or storage device) is physically connected to a computer, or in the case of digital cameras and

5 computers which include IR transceivers these must be located in close proximity before a transfer can be made. For many users, this process is confusing and detracts from the usefulness of the device. When a user wishes to view or share access to a digital photo quickly, this delay and manual transfer process can be both inconvenient and frustrating.

Another potential problem with current digital cameras is that they generally  
10 require creation of a database of images on a home or office computer, which often has limited accessibility, is unsecured, and is infrequently backed up. With the growing popularity of Internet accessible software programs, and "network computers" which include little or no data storage, there is a need for a networked image storage and archival service which provides secure, reliable, and universally accessible image storage services.  
15 Such a service would allow shared access to and transfer of images by family or business groups in a format which would greatly enhance the ability to categorize and sort each image by time, date, and occasion, and which would at the same time greatly reduce the possibility of losing important images. The Fujifilm company is known to offer an Internet archival service in connection with conventional film processing, but there is no known  
20 similar service for digital photos.

When compressed, a color digital image is typically 10K bytes or more in size, and transmission of such an image requires from 10 to more than 30 seconds, depending on wireless modem transmission rates. Cellular service providers typically charge for total circuit connection time or, in the case of wireless data services providers, for the amount of  
25 data transferred, and it is therefore advantageous to reduce the required connection time to perform a file transfer or the amount of data to be transferred. One way to do this is to compress the file before transmission. But even when a file is to be sent to multiple recipients one would not want to initiate multiple calls in order to transfer the file to each recipient, even if the file is compressed. It would be beneficial to have a system which  
30 allowed one to forward an image file, with distribution instructions, to a central repository, and know that the repository would then save and / or automatically distribute the image file according to prior user instructions, without incurring another expensive wireless transfer.

5 Digital cameras which include the ability to effect a wireless RF image transfer are not known to be currently marketed in the United States. A search of issued U.S. Patents has revealed U.S. Patent No. 4,884,132 to Morris et al, which provides a "personal security unit" which includes a digital image sensor, a cellular transmitter, a window aligned with the image sensor, and which transmits digital information identifying the hand-held unit to  
10 a remote cellular receiving station where all cellular communications received from the personal security units are recorded. Morris states that the recorded data can be accessed at a later time if a crime is reported.

Another known device is disclosed in U.S. Patent No. 5,712,679 to Coles which discloses a security system with a method for locatable portable electronic camera image  
15 transmission to a remote receiver. This device provides the means to transmit a video image along with device identifying information and position coordinate information to a remote receiver. Coles states that the transmission may be accomplished by cellular radio and is received by a remote receiver where the image may be displayed or printed by facsimile.

#### 20 SUMMARY OF THE INVENTION

The present invention comprises a wireless digital camera device (also referred to herein as a wireless device) including a processor, RF communications device (modem), memory, and digital camera which is configured to transmit a digital data message,  
25 including at least a digital image, an account ID, and a recipient code, across a combined wireless and wired network to a host system at a predefined Internet Protocol (IP) address. The portable apparatus is programmed to minimize the number of user inputs required for operation in order to operate much like other automatic cameras, providing "aim and shoot" operation. While it is presently possible to assemble a portable device which can  
30 transfer data files, including image files, to a destination computer by using readily available commercial products, such as a portable computer, camera, and cellular modem, such a system requires user input to configure and initialize, including a destination phone number for modem dialing or a host IP or e-mail address to send the image to. The present

5 invention provides a simple wireless photo delivery system which requires minimal user inputs for successful configuration and operation.

In order to simplify the wireless camera apparatus set up and operation, the present invention provides a user-friendly means to customize operational features of the camera. Many computer users today have access to web sites on the Internet, and are familiar with the process of interacting with programs and forms posted on Internet web sites. In one embodiment of the present invention, a digital camera service server provides a means for users to define distribution nicknames and custom operation options, and automatically downloads these custom operational parameters to the wireless camera whenever they are updated.

15 In order for an e-mail system to resolve e-mail addresses into IP addresses it is necessary for a user device to have access to a domain name server (DNS) resolver. This exchange of messages between the remote device and the DNS at time of message delivery is eliminated in one embodiment of the present invention by having e-mail addresses resolved into their corresponding IP addresses by the digital camera service server (subsequently referred to herein as the server) prior to downloading these IP addresses with address nicknames to the wireless camera device. This enables embodiments of the wireless camera device which contain a wireless packet data communications device such as a Cellular Digital Packet Data (CDPD) modem to construct and send messages directly to the intended recipient's known IP address in a protocol format known to those of ordinary skill in the art, such as TCP, Simple Mail Transfer Protocol (SMTP), Internet Message Access Protocol (IMAP), Multipurpose Internet Mail Extensions (MIME), Serial Line Internet Protocol (SLIP), Point to Point (PPP), or Post Office Protocol (POP) without reference to a DNS resolver.

Wireless device users may wish to maintain control over who can send messages to them, in order to avoid paying for unwanted message transmissions. Another aspect of the present invention allows messages generated by the wireless device to be formatted so that the message origin address appears as a server address. This causes all message replies to be routed to the server, which receives and filters all replies addressed to the wireless

5 device and only forwards messages which are from approved sources and in appropriate formats to the wireless device.

There is then a need to provide an apparatus and system which will allow for effortless transfer of a message including a digital image, an account identifier, and an optional recipient code, across a combined wireless / wired network to a host device at a pre-defined IP address. One aspect of the invention provides a digital camera service  
10 server host device at the pre-defined IP address which can store portions of the message, and / or forward select portions of the message and digital image to one or more recipients associated with a message recipient code.

In the case where the delivery IP address corresponds to a server, the data message  
15 may be stored at the server for later access or may be immediately forwarded to one or more IP addresses that correspond to a recipient code included in the data message. When an image is to be sent to multiple recipients, it is much more economical to only incur one transmission from the wireless camera device across the wireless communications link to the server, and then forward the image to each intended recipient through a conventional  
20 wire-line or fiber optic network.

In one embodiment of the present invention, an account is established on the server which corresponds to at least one wireless camera device. This server may be a private system accessible only via a private network, or may be connected to the Internet and be configured to allow wireless device users to access the server by using commonly available  
25 world wide web browsers. In either case the server is preferably remotely accessible in order to establish or update account parameters, or to access previously transmitted digital images and or responses thereto. In the preferred system, each server account is password protected for access only by authorized users. Authorized users may update their server accounts to establish recipient codes, or nicknames, and associate these codes with one or  
30 more destination e-mail addresses, IP addresses, phone numbers (for delivery of audio messages), or storage destinations (such as a server path name), thereby creating nicknames for the purpose of controlling how messages will be archived and / or distributed to individuals or groups.

5 When certain account parameters, such as nicknames, are changed on the server,  
they are automatically flagged to be downloaded in a list to the wireless camera device the  
next time the wireless device contacts the server. Alternately, the wireless device may be  
programmed to get a fresh copy of account parameters, or portions thereof, upon each new  
connection to the server. This nickname list is viewable in a scrollable window on the  
10 wireless camera device, providing a quick means for selecting who a particular data  
message is to be sent to, without concern for entering an e-mail or IP address.

For example, a camera user who is employed as a Realtor may define both business  
nicknames and personal nicknames. Business nicknames may include codes based on  
property attributes (a 3BR2BA code for all customers who are currently looking for a  
15 house with at least three bedrooms and two baths) or may include codes for different  
communities or property price ranges. Finance companies could also use the wireless  
camera to automatically create a photo of the collateral property, as required in many states,  
and simultaneously send the photo to the loan processor and to an archive file.

Other potential uses for the invention include (i) photo-advertisements - for  
20 example, camera can be used by sales agents to send pictures to a list of current clients, to  
an office webmaster, print shops, etc., or to save photos in a pre-defined server directory;  
(ii) journalists could use the system to submit late breaking news pictures; (iii) insurance  
adjusters - photo with claim or file number can be mailed directly to the home office or  
saved in a pre-defined server directory associated with the file; (iv) police - photos of  
25 accident site/crime scene can be captured and archived; and (v) a holiday photo system  
where the camera can be rented while on vacation in order to have photos automatically e-  
mailed to a printing service, or to a list of friends/relatives with whom you want to share  
trip events.

In the preferred embodiment, the invention comprises a battery powered wireless  
30 camera device, including a digital camera for creating a digital image, a memory for storing  
digital images, a delivery IP address, and a list of nicknames, an RF communications  
device connected to the wireless device, and processor means for transmitting a message to  
the delivery IP address via the communications device. Backup memory in the form of a



5 removable disk or memory card may be provided in some embodiments for message storage with or without message transmission. The message includes an account ID, a recipient code (nickname), and at least one digital image created by the digital camera. As further described in the Detailed Description section of this disclosure, in some embodiments, the message may include message origination date, time, a message  
10 classification indicator, digital audio recordings, and/or location coordinates, and in some instances may not include a digital image.

The delivery IP address may be saved in the wireless camera device memory in response to input commands entered at a device user interface, input commands entered remotely via the communications device, or input commands stored in the memory during  
15 manufacture of the wireless device. The RF communications device may be a circuit-switched data modem or packet data modem, and may respectively establish a switched connection through the Public Switched Telephone Network (PSTN) to the server or to a host device and router system at a particular phone number from which messages are transmitted to the destination IP address, or may transmit the message directly through a  
20 cellular service provider digital packet network connection, such as CDPD, to the destination IP address through an Internet connection.

In alternate embodiments, the wireless camera includes a microphone interface for recording audio messages to be transmitted in a digital format with messages. In such embodiments where the interface includes a microphone, a voice recognition module may  
25 be used to translate spoken messages into operational commands. For example, the wireless apparatus may be activated to record a spoken nickname, address, or alphanumeric identifier for association with the message, process this recording with the voice recognition module, and then include the character output of the voice recognition module as a nickname, e-mail address, classification or message field in the next message  
30 transmission. Other interface means may include a bar code scanner, or numeric or alphanumeric keypad

Another embodiment is configured to function as an enhanced digital phone that includes a digital camera. Other embodiments include an optional global positioning

5 system (GPS) unit for capturing location data that may then be included in the message.  
Yet another embodiment of the invention includes a data port which is connected directly  
to the communications device so that the wireless camera device can be used as a portable  
RF modem for external devices which are connected to the data port from time to time.

## 10 BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a high level diagram of the photo delivery system of the present  
invention.

Figure 2 is a block diagram of the wireless device.

Figure 3 shows a representative user configuration table for the wireless device.

15 Figure 4 shows a representative recipient selection view of the wireless device  
interface means.

Figure 5 shows a representative mode selection view of the wireless device  
interface means.

20 Figure 6 shows a representative classification selection view of the wireless device  
interface means.

Figure 7 shows a representative account configuration record on the server of the  
present invention.

Figure 8 shows a server interface means display of account recipient information.

25 Figure 9 shows a server interface means display of representative individual  
recipient information.

Figure 10 shows a server interface means display of representative group  
information.

Figure 11 shows a server interface means display for editing representative group  
information.

30 Figure 12 shows a process flow chart for one embodiment of the wireless camera  
device of the present invention.

Figure 13 shows a process flow chart of the register process of Figure 12.

Figure 14 shows a process flow chart of the get image process of Figure 12.

5           Figure 15 shows a process flow chart of the audio recording process of Fig. 12.  
Figure 16 shows a process flow chart of the format process of Figure 12.  
Figure 17 shows a process flow chart of the custom input process of Figure 16.  
Figure 18 shows a process flow chart of the transmit process of the preferred  
embodiment wireless camera device.

10           Figure 19 shows a data format for data transmitted from the wireless camera device  
to the server of the preferred embodiment.

Figure 20 shows a process flow chart of how the server processes messages  
received from a wireless camera device.

15           Figure 21 shows a process flow chart for how the server responds to wireless  
camera device queries.

Figure 22 shows a process flow chart for how the server responds to messages  
addressed to a wireless camera device.

#### DETAILED DESCRIPTION

20           As will be understood from reading and understanding the following more detailed  
description, the present invention includes a wireless digital camera apparatus, and in the  
preferred embodiment includes the digital camera apparatus as part of a digital photo  
delivery system, which system also includes a server that is accessible through the Internet  
for user updates. Each user of such a system has an assigned server account ID and  
25           password which is required in order to update account parameters and access messages  
stored on the server although in some embodiments users may designate that certain  
images may be stored in a public area from which they may be freely accessed or linked to.  
This photo delivery system 100 is shown in Figure 1 as including a wireless camera  
apparatus 110, which transmits and receives messages via a radio network 120. The radio  
30           network 120 can be any data-capable airlink (such as GSM, TDMA, CDMA), or wireless  
data network such as CDPD, or may be a short range radio link such as an in-building  
network or a radio link between the wireless device and other devices via a standard  
protocol such as the Bluetooth Specification sponsored by Ericsson, IBM, Intel, Nokia, and

5 Toshiba. The radio network 120 is connected to an external network 130, which may be the Internet, an intranet, or other private data network. The external network 130 is connected to at least one wireless camera service server 140, and one or more viewer stations 150 (which will ordinarily comprise a personal computer and may be configured to include a viewer microphone 160 or a viewer camera 170). In alternate embodiments the  
10 external network is connected to a printing service 180.

Major elements of the wireless camera apparatus 110 are shown in block form in Figure 2, as including a digital camera 210, a memory 220, a processor 230, a RF modem 240 which includes an antenna 250, interface means 260, and digital signal processor 266, which in the preferred embodiment are integrated into one unit. However, the wireless  
15 camera device 110 and the server 140 may be programmatically implemented by using many general purpose hardware components. For example, the wireless device 140 may be implemented with a handheld PC such as the Mobilon HC 4100 connected to a CE-AG04 color digital camera card, both available from Sharp Electronics Corporation, and a wireless CDPD modem such as the Sage modem available from Novatel Wireless, Inc.  
20 Alternately, the wireless device may be implemented by programming a Novatel Wireless CONTACT handheld PC (which includes an integrated CDPD modem), now available for beta testing from Novatel, and which is connected to any one of several digital cameras presently available on the market. The invention may also be programatically implemented on a combination of notebook computer running the Windows 95 operating system,  
25 wireless CDPD modem such as the PM100C CDPD modem from Motorola, and digital camera, such as the QuickCam VC from Connectix Corporation or the CMOS-PRO from Sound Vision Incorporated, or the Sony Vaio C1 Picturebook computer that incorporates a digital camera, and a CDPD PC card modem such as the Sierra Wireless Aircard.

Although the RF modem for the preferred embodiment is configured for packet  
30 data transmissions, circuit switched modems may be used without departing from the spirit of the invention. For example, alternate embodiments may include a combined CDPD and circuit switched modem, such as the Sierra Wireless SB220 OEM communications module, in order to allow wireless communication via a circuit switched connection to the

5 server 140 when the wireless device is used in an area where CDPD service is not available.

Figure 3 shows a representative configuration table 310 for the wireless device which in the preferred embodiment system is built on the server 140 and stored in server memory, and downloaded to the wireless device memory 220 after each change to table contents, or upon initial activation of the wireless device 110, although for wireless device embodiments with interface means 260 which provide the ability to input alphanumeric text, the configuration table 310 or portions of it can be modified directly on the wireless device 110. In figure 3 the items in recipient code column 312 are nicknames which may be selected by users of the wireless device 110 in order to control distribution of messages transmitted from the wireless device. Optional recipient type column 314 represents an indication of whether the nickname designates a group nickname (G) an individual nickname (N) or a system processing code (S). Two system processing codes CUSTOM and HOLD are shown. HOLD is the default nickname which is used if no other nickname is selected. When the apparatus is activated to send a photo with HOLD, a message is constructed and sent to the server 140 where it is held for predetermined period of time to await further processing instructions. When the wireless device 110 is activated to send a photo with CUSTOM, a process is activated on the wireless device 110 to allow the user to designate a custom e-mail address prior to transmitting the photo message to the server. Recipient IP address column 316 corresponds to IP address data which is generated by the server 140 before downloading the table to the wireless device 110, and which is applicable only when the nickname is for an individual. Although not shown here, the preferred embodiment configuration table 310 also includes a list of message classifications as further described in reference to Figure 6 below, as well as other custom parameters used to control operation of the wireless device 110.

Figures 4- 6 show a portion of the preferred embodiment wireless device interface means 260 as including a configuration display 198, mode display 200, vertical scroll key 190, horizontal scroll key 192, and select key 194. As will be apparent to one skilled in the art, the configuration display 198 and mode display 200 may be comprised of an active

5 matrix display, LCD display, or other appropriate display means. In other embodiments the scroll keys 190 and 192, and select key 194, may be incorporated into a touch screen display.

Mode display 200 of the preferred embodiment includes three possible operation modes, "TO", "MODE", and "CLASS", which are selected by the horizontal scroll key 192, and the currently selected operation mode is highlighted. When the TO mode is 10 selected, the preferred embodiment configuration display 198 shows up to four recipient codes and their corresponding recipient types from the current configuration table 310. In Fig. 4, three group nicknames and one individual nickname are displayed, with the current selection ("FAMILY") being highlighted. Nickname selection in the preferred 15 embodiment is controlled by the vertical scroll key 190.

Figure 5 shows that when the MODE operation mode view is selected on mode display 200 the configuration display 198 shows a list of current operation modes for that embodiment of the wireless device. The display shown is for an embodiment which allows operation in a "SEND", "SAVE", and "SEND LAST" mode. For illustration purposes, the 20 preferred embodiment, which allows the capability to record an audio message for transmission along with a digital photo image, would have operational modes of "SEND", "SEND W/ AUDIO", "SAVE", "SAVE W/ AUDIO", "SEND LAST" and "AUDIO ONLY", corresponding respectively to transmitting an image without an audio message, transmitting an image with an audio message, saving an image without transmitting it, 25 saving an image and an audio message without transmitting, transmitting the last saved message, and transmitting only an audio message.

Figure 6 shows that when the CLASS operation mode is selected on mode display 200 the configuration display 198 shows a list of current message classifications, which may be selected by operation of vertical scroll key 190. When the wireless device 110 is 30 activated to send a message with the CUSTOM classification selected, a process is activated on the wireless device 110 to allow the user to designate a custom message classification, such as a customer number or name, prior to transmitting the photo message to the server 140. Various message classifications may be customized on the server 140 of

5 the preferred embodiment and downloaded to the wireless device 110 along with other portions of the configuration table 310 as will be later described in relation to Figure 13.

Figure 7 shows a representative account configuration record on the server 140 of the present invention. In the preferred embodiment wireless photo delivery system each wireless device user will have an account configuration record on the server which includes  
10 an account ID 321, a password 322, an account name 323, a contact name 324, a billing address 325, a camera id 326 which corresponds to the RF modem 240 network equipment identifier or IP address (for those devices with a packet data modem), a wireless device dial ID number 327 corresponding to the phone number associated with the RF modem 240 (for those devices with a standard circuit switched cellular modem), and date fields 328 and  
15 329 corresponding to the dates for which account service has been established. Other embodiments include a Direct or Server switch field 330 which is used to indicate whether wireless device messages to individual nicknames will be transmitted first to the server for distribution or directly to the nicknames associated IP address. In such embodiments, only messages which are transmitted to the server can be archived.

20 Figures 8- 11 depict server interface means displays in the preferred embodiment for establishing and maintaining account recipient information which are preferably accessible via any Internet browser program, and which are stored in server database tables, along with the Figure 7 account configuration record, in any number of ways which will be apparent to those who are skilled in the relevant art using standard techniques such as  
25 active server pages accessing a relational database. Figure 8 shows a people or individual address screen 340 view of all account message recipients in column 342, associated nicknames in column 344, associated e-mail addresses in column 346, and edit and delete selector buttons in columns 348 and 350. Other user selection buttons in this screen view are a drop down list view selector 352 and a group view selector button 354. The top of  
30 this display shows the account e-mail address 341 which is associated with this server account. This address 341 in the preferred embodiment is comprised of the Account ID (represented here as XXXXXX), and the server domain name (represented here as YYYY.COM). In one embodiment, any e-mail messages which are received by the server

5 for this e-mail address in an acceptable format from authorized e-mail addresses (as further described below) will be forwarded to the associated wireless device.

Figure 9 shows a server interface means display address book detail screen 360 of representative individual recipient information, corresponding to the last address book entry shown in figure 8, and indicating the allowed level of detailed information which is stored on the server 140 for each account individual recipient record in the preferred embodiment. Most of these fields are self describing, but e-mail reply OK indicators 362 and 364 are used by one embodiment server to build an account table of all e-mail addresses where this indicator is set to Y. This table is checked when the server receives e-mail addressed to the account e-mail address, and if the sender's e-mail address is found in the table then the e-mail will be forwarded in an appropriate format to the wireless device. Phone numbers 366 are optional, but are included for embodiments which are capable of forwarding wireless device messages which include an audio portion to a telephone or voice mail number, which can be accomplished in many ways apparent to those skilled in the relevant art. Path 367 is optional and is included for embodiments where the message is to be saved under a specific server directory path in lieu of or in addition to being distributed.

Figure 10 shows a server 140 interface means group view display 370 of representative group information which is accessed in the preferred embodiment by selecting the group view selector button 354 shown in Figure 8. This group view display 370 shows currently defined account groups and includes a people view selector button 372, an add new entry selector button 374, a group names display column 376, an edit selector button column 378 for each group name, and a delete selector button column 380. Selection of people view button 372 will take you back to the view of Figure 8, and selection of add new entry selector button 374 or any edit selector button in column 378 will take you to the group detail view of Figure 11.

Server 140 interface means group detail view display 390 for editing representative group information in the preferred embodiment is shown in Figure 11. This particular group detail view shows hypothetical entries for a group name "MANSE" in group name



5 selector field 392. When the detail view 390 is activated by the add new entry selector  
button 374 of Figure 10, the group name selector field would be blank, and all defined  
individuals would be displayed in non-member display column 394. The preferred group  
detail view 390 includes vertical scroll bars 396 and 396' and a group member display  
column 398. Other user selectable buttons on the preferred group detail view include add,  
10 remove, delete, and done buttons, which operate respectively to add highlighted non  
members shown in column 394 to the group, to remove highlighted members shown in  
column 398 from the group, to delete the entire group, or to return to the group view  
display 370 of Figure 10 after processing any changes.

Figure 12 shows the overall method used to operate one embodiment of the  
15 wireless camera device of the present invention which includes both switched circuit  
cellular and wireless packet data modem capabilities. The process begins at block 402  
where a flag is checked to determine whether the wireless packet data modem is to be used.  
If so, processing continues with the registration process of block 404, which is shown in  
further detail in Figure 13. In the alternative the registration process is skipped and  
20 (although not shown here) wireless devices with circuit switched modems may contact the  
server 140 to obtain a fresh configuration table 310 before processing continues at block  
406, where processing halts until a signal is received indicating the send key 196 has been  
activated. At block 408 the operation mode is checked, and if the SEND LAST switch is  
set processing branches to block 410 where the first previously held message is marked to  
25 be sent, after which processing returns to a wait state at block 406. If the send last flag is  
not set, and the operation mode is not AUDIO ONLY, the GET IMAGE routine of figure  
14 is activated at block 412. If at block 414 the AUDIO ONLY, SAVE W/ AUDIO, or  
SEND W/ AUDIO operation mode is set, the AUDIO routine of figure 15 is activated at  
block 416 before activating the FORMAT routine of figure 16 at block 418. If at block  
30 420 the operation mode is set to SAVE or SAVE W/ AUDIO processing branches to block  
422 where the formatted message is saved in memory 220 and marked to be held in the  
wireless device memory, but if the operation mode is not set to save the message, then at  
block 423 the message is saved in memory 220 and marked to be sent as soon as possible,

5 and at block 424 the Transmit function of Figure 18 is invoked, if this is not already active. In either case processing continues at block 426 where if memory is full, a warning is issued to the operator via the user interface means 260 which, in those embodiments that have flash memory or other removable memory devices, would prompt the user to replace memory device 220, before branching back to the beginning of the method at block 400.

10 While this describes the best mode embodiment process, it will be apparent to those skilled in the art that many steps may be executed in an altered order or may be otherwise modified without departing from the scope of the invention as claimed herein.

Figure 13 shows a process flow chart of the registration process of Figure 12 which is activated in the preferred embodiment as well as any other embodiments which include a

15 wireless packet data modem. Once registered with a wireless packet data service provider network, wireless packet data modems can remain registered for an indefinite period of time and most such modems, including the wireless packet data modem of the preferred embodiment, periodically query the network to verify that the device is still registered and set an indicator if the registration is dropped. In most instances, this Figure 13 routine will

20 execute only once upon powering up the wireless device 110, and thereafter the indicator check at block 432 will branch to return back to the calling routine of figure 12. In case the wireless device is not registered with the network, a registration routine on the RF modem 240 will be initiated to register with the network at block 434. Next, at block 436 a query will be transmitted to the server 140 indicating that the device is registered, and requesting

25 the server to transmit a copy of the configuration table 310 if this has been updated since the last time the wireless device was used. Finally, at step 438 the wireless device will receive and save any configuration table updates received from the server. In alternate embodiments, the wireless device 110 may simply log in to the server and retrieve its associated configuration table 310 in a manner well known in the art.

30 Figure 14 shows a process flow chart of the get image process routine which is activated from block 412 of the preferred embodiment main process of Figure 12. This process initially signals the digital camera 210 to save a digital image at block 440, may then compresses this image in memory 220 according to a standard compression scheme

5 such as GIF or JPEG at block 442, and for embodiments with a interface means 260 which includes a display capable of showing a reduced version of the image, display the image at block 444. Other embodiments may alternately be configured to constantly display the image currently being received by the digital camera 210, or in very simple embodiments may be configured only with a viewfinder and have no interface means 260 capable of  
10 displaying any image. Still other embodiments may skip the compression stage as it is recognized that larger files generally are more detailed and desirable, and compression to a small size prior to transmission may be less important in the future as greater wireless bandwidth becomes available.

Figure 15 shows a process flow chart of the audio recording process of Figure 12 as  
15 including a first processing step 450 which displays or plays a visual or audible prompt asking the wireless device user to record a voice message. Wireless devices which are equipped to allow audible message recording, including the preferred embodiment, have an interface means 260 which includes a record button which must be depressed and held while a message is recorded at block 452. Otherwise the record function could be  
20 automatically activated for a set period of time at block 452. After the recording ceases, the message is played back at block 454, and the user is asked at block 456 if the message is acceptable. If the user indicates the message is acceptable, the audio process ends, and if the message is not acceptable processing branches back to block 450 to repeat the message recording process.

25 Figure 16 shows a process flow chart of the preferred embodiment message format process 418 of Figure 12 as including a first check 460 to determine whether the operation mode is set to include a custom classification. If so, the custom input process is invoked at a first entry block 466 with a parameter indicating that a custom classification is requested, before processing continues at block 461 where the message header is constructed in a  
30 buffer area of memory 220. This message header 534, as shown in more detail in Figure 19, includes such data as the account ID, Classification, date, time, and location coordinates if available. At block 462 the currently designated recipient code 536 is moved into the buffer area. At block 464 a check is performed to determine whether a

5 custom recipient code/e-mail address was requested. If so, the custom input process is invoked at a second entry block 466' with a parameter indicating that a custom address is requested, after which the custom address is moved into the buffer area at block 467. Otherwise, processing continues at block 468 where the image is moved into the buffer area. Then at block 470 a check is performed to determine whether the AUDIO ONLY,  
10 SAVE W/ AUDIO, or SEND W/ AUDIO operation mode is set, indicating that an audio message was recorded. If so, the audio message is moved into the buffer area at block 472. Otherwise, processing continues at block 474 where an end of message indicator is moved into the buffer area. Throughout this process appropriate delimiters will be added to indicate message field boundaries, and a current message length field updated  
15 appropriately, in a manner which is well known in the art.

In other embodiments, the message may be formatted by the wireless device 110, and account ID and recipient code transmitted to the server, by a different mechanism without departing from the spirit of the invention. For example, an image file may be assigned a unique file name, including the account ID, recipient code, and an image  
20 identifier, for later transfer via FTP Put command to the server 140. Similarly, audio messages could be sent separately to the server 140 under a corresponding file name for later association with the image file by a process on the server.

Figure 17 shows a process flow chart of the preferred embodiment custom input process 466 and 466' of Figure 16, wherein at block 480 a check is performed to determine  
25 whether the routine was activated to provide a custom address or a custom classification. If for a custom address, the user is prompted by the interface means 260 display or by audio prompt to enter the recipient's e-mail address. The address is entered via the user interface means 260, via a microphone and voice recognition module on certain embodiments or via other input means such as selections from a scrollable list of alpha numeric characters, or  
30 via keyboard input. The address is displayed at block 484 and the user is asked to verify this at block 485. If the address displayed is incorrect, processing branches back to block 482, and, if correct, processing continues at block 486 where the custom address is saved in memory. If the custom input routine of figure 17 is entered to provide a custom message

5 classification, then a similar process is executed at blocks 488 through 494 whereby a custom classification is entered and saved in a designated area of memory 220.

In the preferred embodiment a separate processing loop, as shown in Figure 18, is invoked to transmit messages from the wireless device to the server. This allows users to quickly take several pictures without waiting for the prior picture to be transmitted. A standard wireless packet data routine is utilized to receive messages by the RF modem 240 in a manner well known to those of ordinary skill in the art and is not further described here. As previously described in relation to Figure 12, the transmit process is invoked (if it is not already active) after a message has been formatted in memory 220 for transmission. Upon activation an indicator on the wireless device is checked to determine whether the transmission is to be accomplished as packet data or as circuit switched data. This indicator may be set to only allow packet or circuit data transmissions, or may be set dynamically in embodiments which include the capability to transmit both as packet data or circuit data depending on the availability of a packet data network, so that one form of transmission may be established as preferred, but if that form is not available, then the other form of transmission will be attempted.

If as circuit switched data, block 512 process is invoked to establish a switched circuit modem connection between the wireless device and either the server 140 or a known host which is capable of transmitting the message according to an IP protocol to a defined destination IP address. Formatted messages are stored in memory 220 until transmission is complete, and at block 514 a pointer is established to the first message in queue in memory. At block 516 the message is checked to determine whether the message is on hold, or is marked to be sent, and if marked to be held processing branches to block 526. If not held, a second check regarding packet data is performed at block 518, and if the wireless device 110 is set for packet data transmissions a routine at block 520 formats the message for transmission, preferably by the TCP/IP protocol, or by other IP protocols which are well known to those of ordinary skill in the art of packet data transmissions, and activates the RF Modem, which in some embodiments may be preconfigured to transmit the message according to a particular protocol.

5 If the wireless device 110 is not set for packet data transmissions, then the message is transmitted to the server 140 or a known host which is capable of forwarding the message according to an IP protocol to the server. This is preferably accomplished as an asynchronous data transmission in compressed form, such as the V.42bis compression protocol in order to reduce transmission time.

10 Regardless of the type of transmission, after the transmission is attempted in the preferred embodiment, common processing continues at block 524, and if no error flag was set during transmission, the transmitted message is deleted from memory. However, in other embodiments, the user may wish to maintain a copy of the message after transmission, for back up or other purposes, in which case the message may be marked to  
15 be held instead of being deleted at this point. At block 526 the next message slot in the memory queue is pointed to and if another message is in the memory queue processing continues back at block 516. Otherwise, a final check is performed at block 528 to see if a circuit switched data transmission is being used, and if so, the circuit is terminated at block 530.

20 In addition to the processing routines which drive the server interfaces of Figures 7 through 11 and the database calls which are required to support these interfaces, the preferred embodiment server 140 includes several specific processes related to message transmissions both from and to wireless camera devices 110, and which are shown in Figures 20 through 22. Figure 20 shows a process flow chart of how the server processes  
25 messages received from a wireless camera device. At block 544 the server receives a message, parses out information such as account number, image, audio data, date, time, classification, location, and recipient code which is included in the message, saves this in a server memory for future access and in a holding area designated for this account, and if a path is associated with the recipient code saves the message at that location. At block 546  
30 the server determines whether the message is to be held or if the account is no longer valid, in which case no further action is taken, and the message will be marked for deletion after a predetermined period of time absent further action. At block 548, if a custom address was included in the message, then processing branches to block 550, where the address may be

5 resolved into an IP address before being formatted as a standard e-mail message and transmitted to the recipient or this may be handled automatically by a commercially available e-mail program such as MS Outlook, depending on how the server is configured. Otherwise, if the message is to an individual then processing continues directly at block 554. If the message is to a group, then a list of recipient addresses is retrieved at block 10 556, and at block 558 the message is formatted as a standard e-mail message and transmitted to each recipient. Some embodiments may only send out a thumbnail version of images and/ or a hyperlink to the server path or URL where the message has been saved.

Certain embodiments may allow delivery of the audio portion of messages to a recipient's phone number, in which case a separate server process would be invoked to 15 make a set number of attempts to deliver the message to the listed phone number or a voice mail system at that number, after which the message would be marked undelivered. If the message recipient wished, they could leave a reply message immediately, via an interactive voice process on the server, which reply the server would later attempt to deliver, or the recipient could call back later to a designated number and enter a response ID number, 20 both as specified with the original message delivery, in order to leave a reply message.

Figure 21 shows a process flow chart for how the preferred embodiment server 140 responds to queries from the wireless camera device 110 in order to download the current account configuration table to the wireless device. At block 572 the server receives a query from the wireless device as previously discussed in relation to Figure 13. If there have 25 been any changes to the account since the last download, then processing continues from block 574 to block 576 where the server contacts a domain server in order to resolve all individual IP addresses for e-mail addresses associated with account individuals' e-mail addresses. At block 578 the updated configuration table is transmitted to the camera in a prescribed format, and the last download data is updated for the account. In other 30 embodiments the wireless device 110 may simply log into the server 140 upon initial activation of the wireless device and registration with the wireless packet data network and retrieve its associated configuration table, as by an FTP Get command.

Figure 22 shows a process flow chart for how the server responds to messages

5 received by the server 140 and addressed to an address associated with a wireless camera device 110. The message is typically received at block 588 as an e-mail message, but as previously discussed may comprise a voice mail message. If the account is valid, then processing will continue at block 594; otherwise the server will attempt to respond that the account is no longer valid. As discussed previously in relation to Figure 9, the account  
10 data is checked at block 594 to determine whether a reply from this source is authorized. If a reply is authorized, the message is reformatted in a form which will be recognized by the wireless device, and transmitted to the camera ID at block 596. In either case, in the preferred system the reply is archived for a predetermined number of days before being deleted, and will be accessible for review prior to deletion via Internet account access or  
15 via other means, such as for example embodiments where the server 140 and wireless device 110 are configured respectively as server and client using the IMAP protocol as previously discussed.

Use and operation of the preferred embodiment of the present invention may be better understood by reference to the figures in connection with the following description.

20 The wireless device user will obtain a wireless device 110 and register it with a wireless packet data network service provider, who will assign a camera id 326, or dial id 327, account validity dates 328 and 329, initialize the RF modem to recognize the appropriate id, and arrange for initialization of the account information 320 (fig. 7) on the server 140. The user will then be able to logon to the server and initialize preferred address book entry  
25 details as shown in Figures 8 - 11, or this information may be provided directly to a service provider who will initialize the address book on behalf of the user. Alternately, and in cases where the user does not own a wireless device but only rents one on occasion, the user may establish an account and initialize address book details at his or her convenience prior to obtaining a wireless device, and the wireless device provider will associate a particular  
30 device with this account information when the user picks up the device. Next, the user can activate the wireless device 110, which will automatically initiate the process of Figure 12 to register the wireless device with the packet data network and download updates as previously described in relation to figures 13 and 21. After the configuration table is



5 initialized on the wireless device, the user will be able to operate the wireless device 110  
interface in order to select a recipient code, mode, and classification, as described in  
relation to figures 4 - 6. If this step is skipped, the default values for any transmitted  
messages will be respectively set for HOLD, SEND, and NONE. The user will then be  
able to activate the camera by pressing the send key 196, which will activate processing of  
10 Figure 12 subsequent to block 406 in order to capture an image and transmit it as part of a  
message to the server 140 for processing and distribution according to the selected  
recipient code as described in relation to figure 20.

Whereas the present invention has been described in detail with specific reference  
to particular embodiments thereof, it will be understood that variations and modifications  
15 can be effected within the spirit and scope of the present invention as hereinbefore  
described and as defined in the appended claims.

## CLAIMS

- 1 1. A wireless digital camera apparatus, comprising:  
2 a digital camera including a processor, user interface means, and a memory;  
3 a RF communications device connected to said processor; and  
4 processor control means, responsive to signals received from said user interface  
5 means, for capturing digital images and storing said images in said memory,  
6 selecting and storing a destination address in said memory, and transmitting a  
7 message, including at least one said digital image, via said RF communications  
8 device to a remote system associated with said destination address.
- 1 2. Apparatus of claim 1, wherein said user interface further comprises means for  
2 selecting a recipient code from a predefined list stored in said memory, said remote  
3 system comprises a messaging server, and wherein said message further includes  
4 said recipient code.
- 1 3. Apparatus of claim 1, wherein said user interface further comprises means for  
2 entering a recipient address and wherein said message further includes said  
3 recipient address.
- 1 4. Apparatus of claim 3, wherein said means for entering a recipient address  
2 comprises a microphone and voice recognition module.
- 1 5. Apparatus of claim 1, wherein said user interface further comprises means for  
2 selecting a classification for said digital image and wherein said control means  
3 further transmits said classification with said message.
- 1 6. Apparatus of claim 1, wherein said user interface further comprises means for  
2 creating a digital audio recording and wherein said control means further transmits  
3 said digital audio recording with said message.
- 1 7. Apparatus of claim 1, wherein said user interface further comprises a serial data  
2 port.

- 1 8. Apparatus of claim 1, wherein said user interface further comprises means for  
2 selecting a recipient code from a predefined list stored in said memory, and wherein  
3 said message further includes said recipient code.
- 1 9. A wireless digital apparatus, comprising:  
2 a processor, and user interface means and a memory connected to said processor;  
3 a RF communications device connected to said processor; and  
4 processor control means, responsive to signals received from said user interface  
5 means, for establishing a communication link to a remote system associated with a  
6 destination address stored in said memory, capturing message data, transmitting one  
7 or more messages, via said RF communications device to said remote system, and  
8 capturing new message data in response to signals received from said user interface  
9 at the same time messages are being transmitted.
- 10 10. Apparatus of Claim 9, further comprising a digital camera connected to said  
11 processor, and where message data includes at least one digital image captured by  
12 said digital camera.
- 13 11. Digital photo delivery system comprising:  
14 a wireless digital camera apparatus, wherein said apparatus includes a processor; a  
15 memory; a destination address stored in said memory; user interface means  
16 connected to said processor; a digital camera means connected to said processor; a  
17 RF communications device connected to said processor; and processor control  
18 means, responsive to signals received from said user interface means, for  
19 transmitting a message, including at least an account identifier, a recipient code,  
20 and one said digital image, to said destination address via said RF communications  
21 device; and

22 a server associated with said destination address and responsive to messages  
23 received at said destination address from said wireless digital camera apparatus;  
24 server memory means for storing account configuration records, including message  
25 recipient code distribution data, and associated with said account identifiers; server  
26 communications means; and server control means for parsing said account  
27 identifier and said recipient code from each said message, and processing each said  
28 message according to message recipient code distribution data associated with said  
29 account identifier and said recipient code, which processing may include  
30 transmitting portions of said messages to at least one pre-defined recipient  
31 associated with said recipient code via said server communications means.

1 12. Digital photo delivery system of claim 11, wherein said server control means  
2 further comprises means for transmitting account configuration data to said wireless  
3 digital camera apparatus in response to receiving a signal from said wireless digital  
4 camera apparatus, and wherein said processor control means is further responsive to  
5 said account configuration to update said memory.

1 13. Digital photo delivery system of claim 11, wherein said RF communications device  
2 comprises a wireless transceiver and said processor control means transmits  
3 according to a CDPD protocol.

1 14. Digital photo delivery system of claim 11, wherein said RF communications device  
2 comprises a modem suitable for connection to a PSTN and said processor control  
3 means comprises a processor for generating commands to link said wireless digital  
4 camera apparatus to an Internet service provider network and transmit said message  
5 to said destination address.

1 15. Digital photo delivery system of claim 11, wherein said server control means

2 further comprises message reply filter means for receiving messages addressed to  
3 each said wireless digital camera apparatus and only forwarding to said wireless  
4 digital camera apparatus those messages which originate from an address that is  
5 authorized for a reply in said account configuration record associated with said  
6 wireless digital camera apparatus.

- 1 16. A method in a data processing system for transmitting an image to a remote system  
2 associated with a predetermined destination address, comprising:  
3 registering with a wireless packet data network;  
4 obtaining a digital image from a digital camera;  
5 formatting a message, including at least one said digital image and an account  
6 identifier; and  
7 transmitting said message via said wireless packet data network to said remote  
8 system associated with said predetermined destination address.

- 1 17. Method of claim 16, further comprising the step of processing said message on said  
2 remote system to retrieve one or more preselected recipient addresses  
3 corresponding to a recipient code in said message; and  
4 retransmitting at least said image to each preselected recipient address.

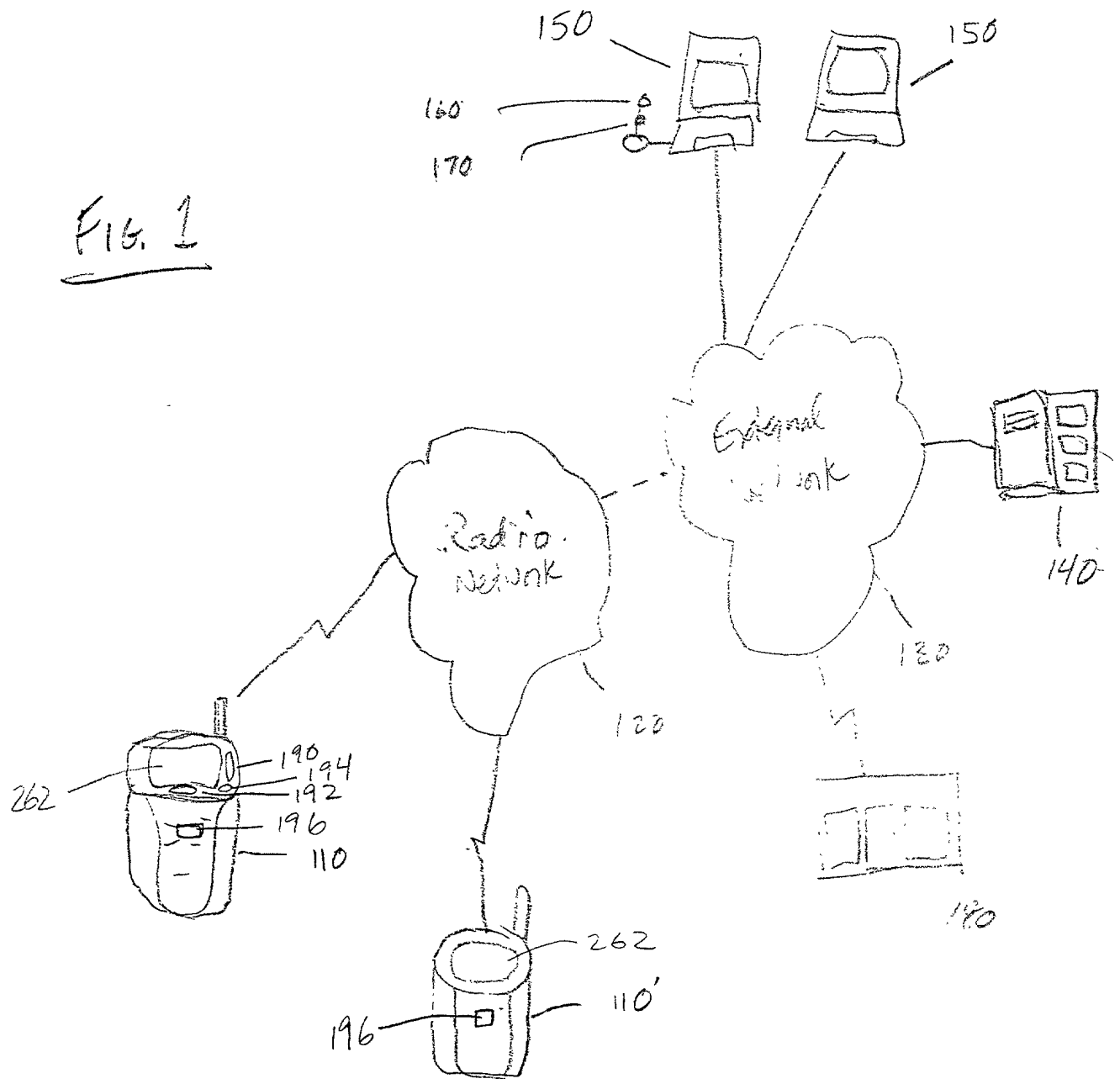
- 1 18. A method in a wireless device that includes a RF communications device, a  
2 memory containing a destination address, a processor, and user interface means, for  
3 updating configuration table data on the wireless device with configuration table  
4 data modified on a remote server that is associated with the destination address,  
5 comprising:  
6 establishing a communication link between the wireless device and the server via  
7 the RF communications device; and

8 transmitting configuration table data from the server to the wireless device.

5    ABSTRACT

The invention comprises a wireless camera apparatus and system for automatic capture and delivery of digital image “messages” to a remote system at a predefined destination address. Initial transmission occurs via a wireless network, and the apparatus process allows the simultaneous capture of new messages while transmissions are occurring. The destination address may correspond to an e-mail account, or may correspond to a remote server from which the image and data can be efficiently processed and / or further distributed. In the latter case, data packaged with the digital message is used to control processing of the message at the server, based on a combination of pre-defined system and user options. Secured Internet access to the server allows flexible user access to system parameters for configuration of message handling and distribution options, including the option to build named distribution lists which are downloaded to the wireless camera. For example, configuration data specified on the server may be downloaded to the wireless camera to allow users to quickly specify storage and distribution options for each message, such as archival for later retrieval, forwarding to recipients in a distribution list group, and / or immediate presentation to a monitoring station for analysis and follow-up. The apparatus and system is designed to provide quick and simple digital image capture and delivery for business and personal use.

Fig. 1



100



5520307

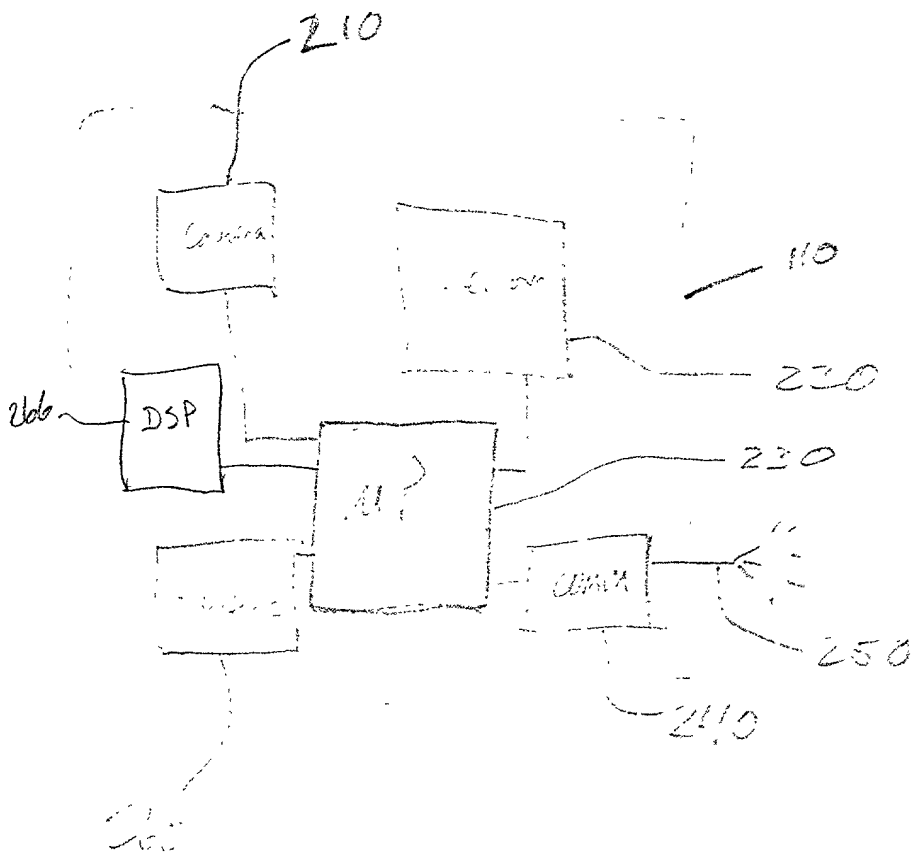


Figure 2

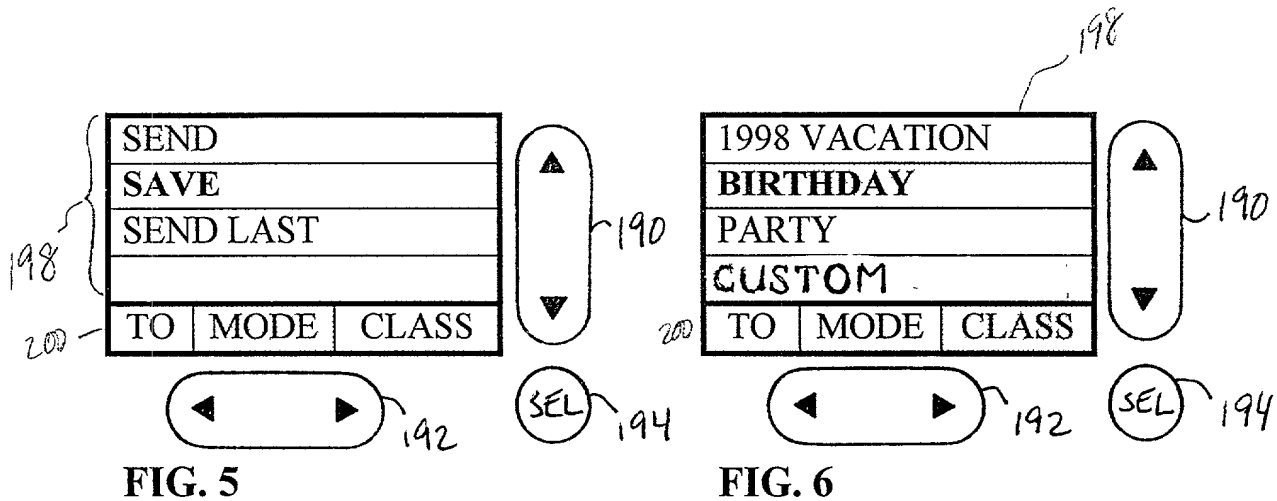
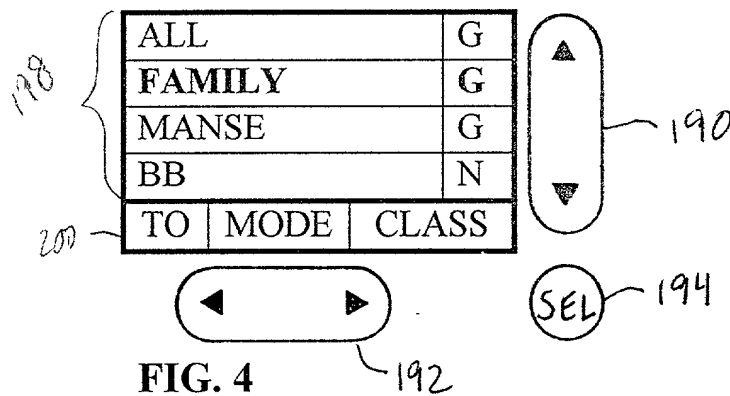
312      314      316

↓      ↓      ↓

310

3BR2BA	G	
ALL	G	
FAMILY	G	
MANSE	G	
BB	N	XXX.XXX.XXX.XXX
JBOB	N	XXX.XXX.XXX.XXX
JDOE	N	XXX.XXX.XXX.XXX
JDOE2	N	XXX.XXX.XXX.XXX
JEFF	N	XXX.XXX.XXX.XXX
REGAN	N	XXX.XXX.XXX.XXX
TB	N	XXX.XXX.XXX.XXX
CUSTOM	S	
HOLD	S	

FIG. 3



320

<b>Account ID</b>	XXXXXXX	321
<b>Password</b>	PPPPPPPP	322
<b>Account Name</b>	ReMax NC	323
<b>Contact Name</b>	Joe King	324
<b>Billing Address</b>	100 Atlantic Blvd Suite 100 Charlotte, NC 27999	325
<b>Camera ID</b>	yyy.yyy.yyy.yyy	326
<b>Dial ID</b>	zzz.zzz.zzzz	327
<b>Active from</b>	MMDDYY	328
<b>Active to</b>	MMDDYY	329
<b>Direct/Server(D/S)</b>	S	330

FIG. 7

Address Book for XXXXXX@YYYY.COM <sup>341</sup>

View:

People

Groups <sup>354</sup>

View by Group:

ALL



Add New Entry

<sup>340</sup>

Full Name	Nickname	Address	Edit	Del
Tammy Baker	TB	baker1@aol.com	←	Ø
Jim Baker	jbob	baker@aol.com	←	Ø
Bill Blass	BB	bb@aol.com	←	Ø
John Doe	Jdoe	jdoe@aol.com	←	Ø
Jane Doe	Jdoe2	Ja_doe@aol.com	←	Ø
Nan Regan	regan	nr2@aol.com	←	Ø
Jeff Smith	jeff	jsmith@aol.com	←	Ø

<sup>342</sup>↑

<sup>344</sup>↑

<sup>346</sup>↑

<sup>348</sup>↑

<sup>350</sup>↑

FIG.

8

## Edit/View Address Book Entry

**Save**

**Entry Name: Jeff Smith**

**First name**

**Jeff**

**Last name**

**Smith**

**Nickname**

**jeff**

**e-mail**

**jsmith@aol.com**

**Reply OK (Y/N)**

**N**

**e-mail2**

**Reply OK (Y/N)**

**N**

**Work Phone**

**919.888.8888**

**Home Phone**

**Fax Number**

**Mobile Phone**

**Path**

**Z:\images\epic\**

**Mailing Address**

**Address2**

**City**

**Zip**

**Birthday**

360

362

364

366

367

**FIG. 9**

Address Book for XXXXXX@YYYY.COM <sup>341</sup>

View: 

People <sup>372</sup>

 Groups

Add New Entry <sup>374</sup>

Group Name	Edit	Del
3br2ba	←	Ø
All	←	Ø
family	←	Ø
manse	←	Ø

370

<sup>376</sup>↑      <sup>379</sup>↑      <sup>380</sup>↑

FIG. 10

FIG. 10

## Edit Group

Group Name:

manse

Non-Members	
Tammy Baker (baker	▲
jim baker (baker@ao	
John doe (jdoe@aol.	
jane doe (ja_doe@a	
Jeff Smith (jsmith@a	
	▼

Add >>

<<Remove

Delete Group

Done

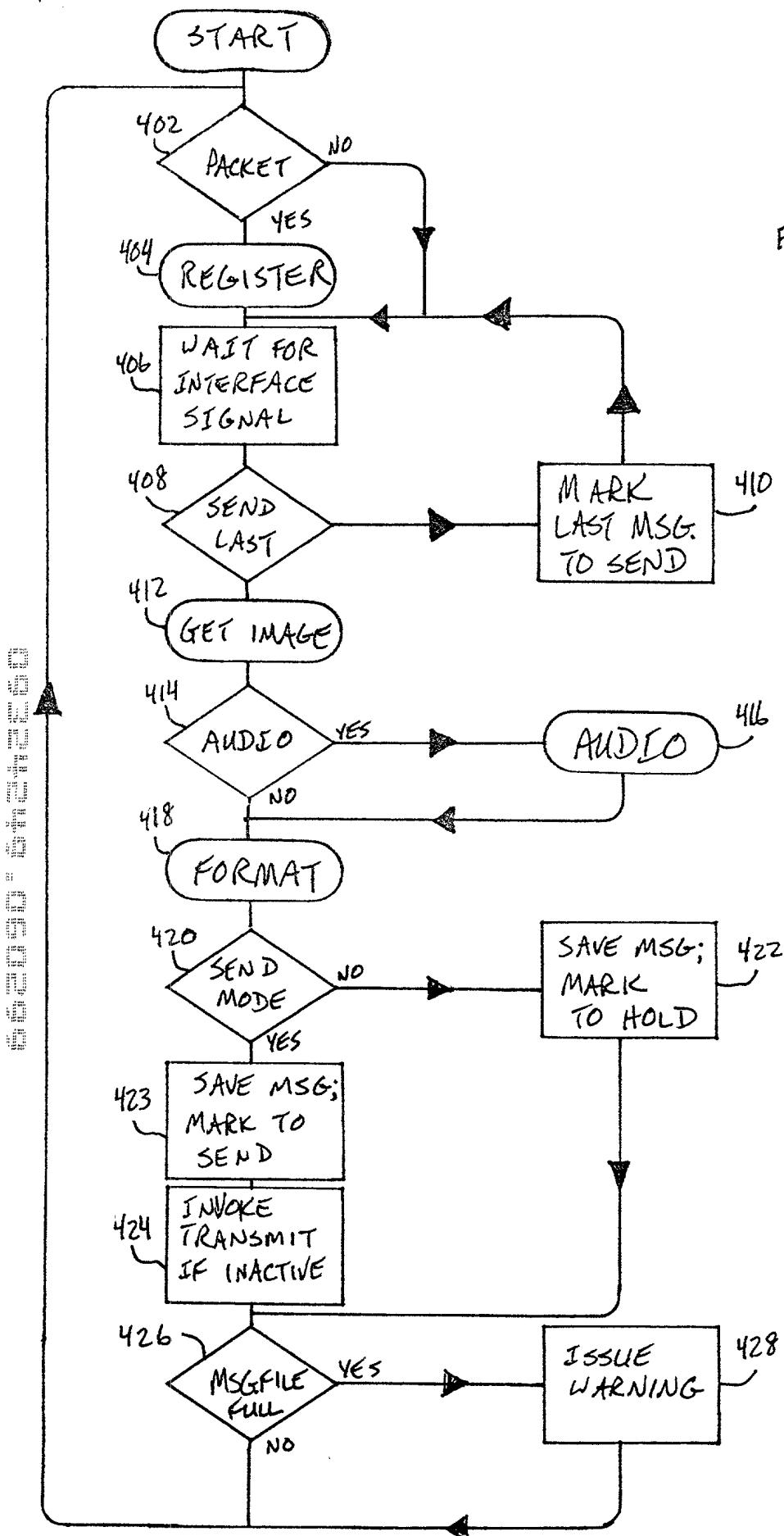
Group Members	
Bill Blass (bb@ao	▲
Nan Regan (nr2@	
	▼

FIG. 11

394 ↑ 396 ↑

398 ↑ 396' ↑

FIG. 12





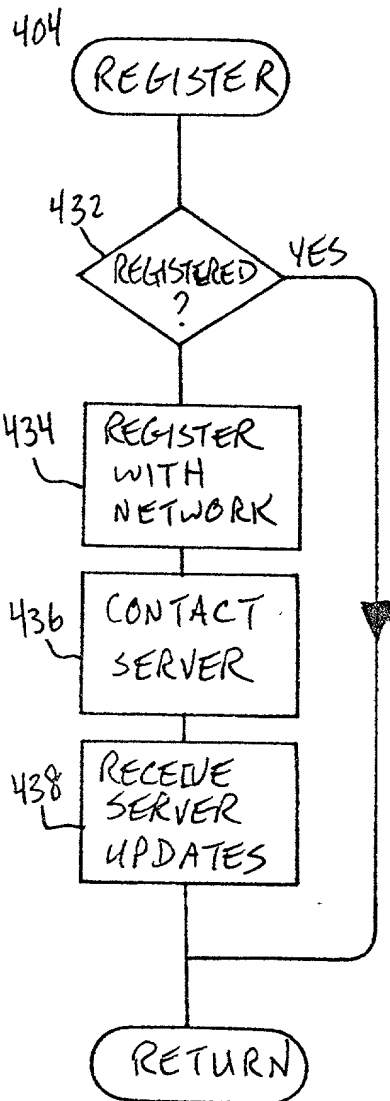


FIG. 13

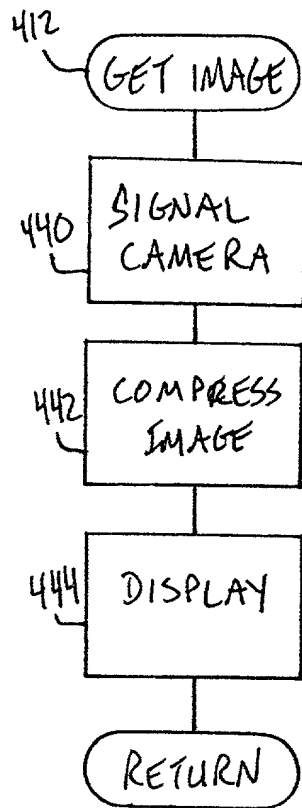


FIG. 14

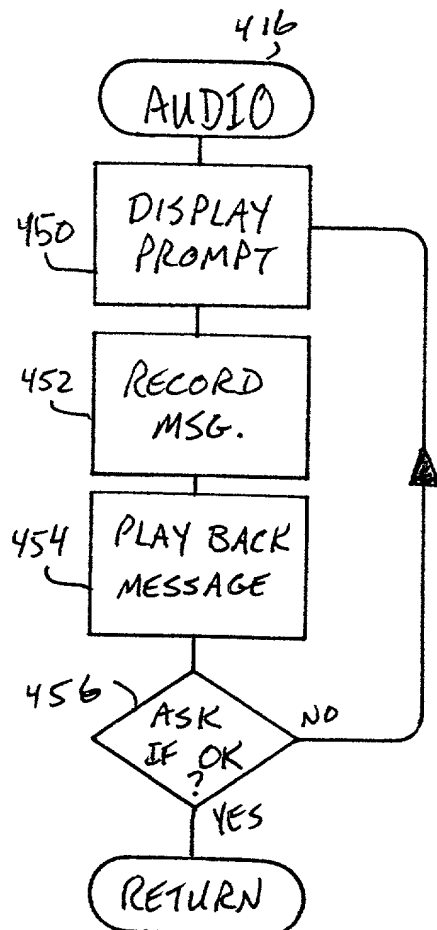


FIG. 15

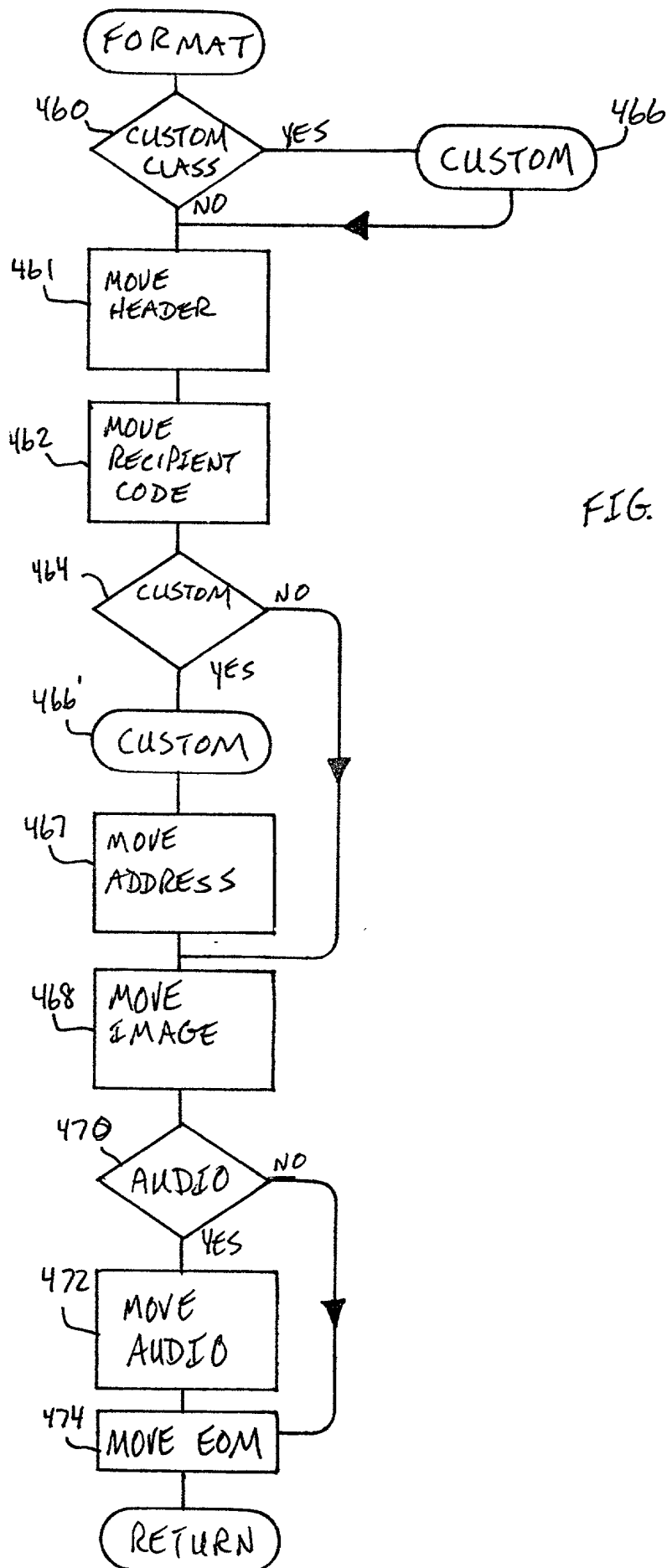


FIG. 16

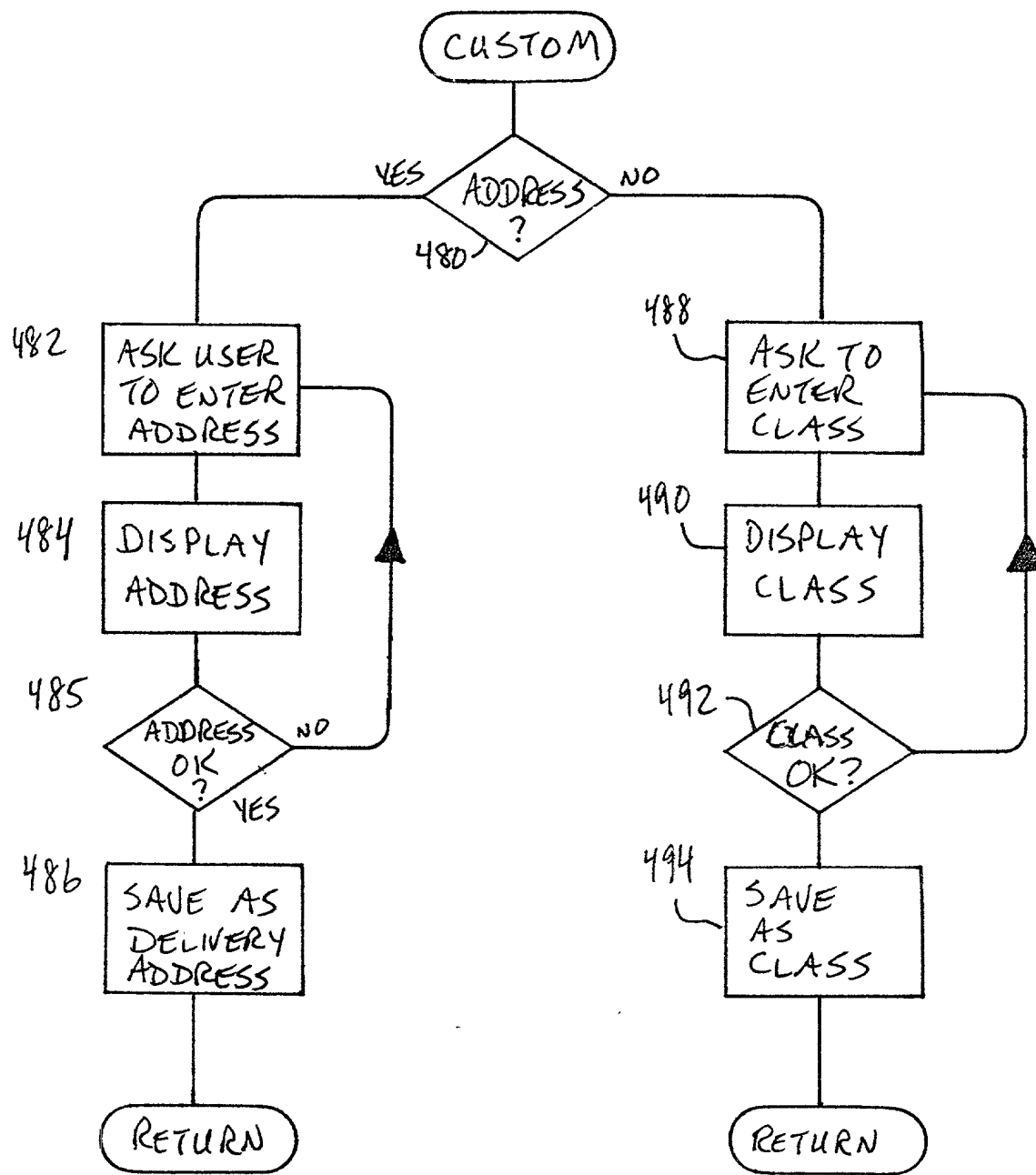


FIG. 17

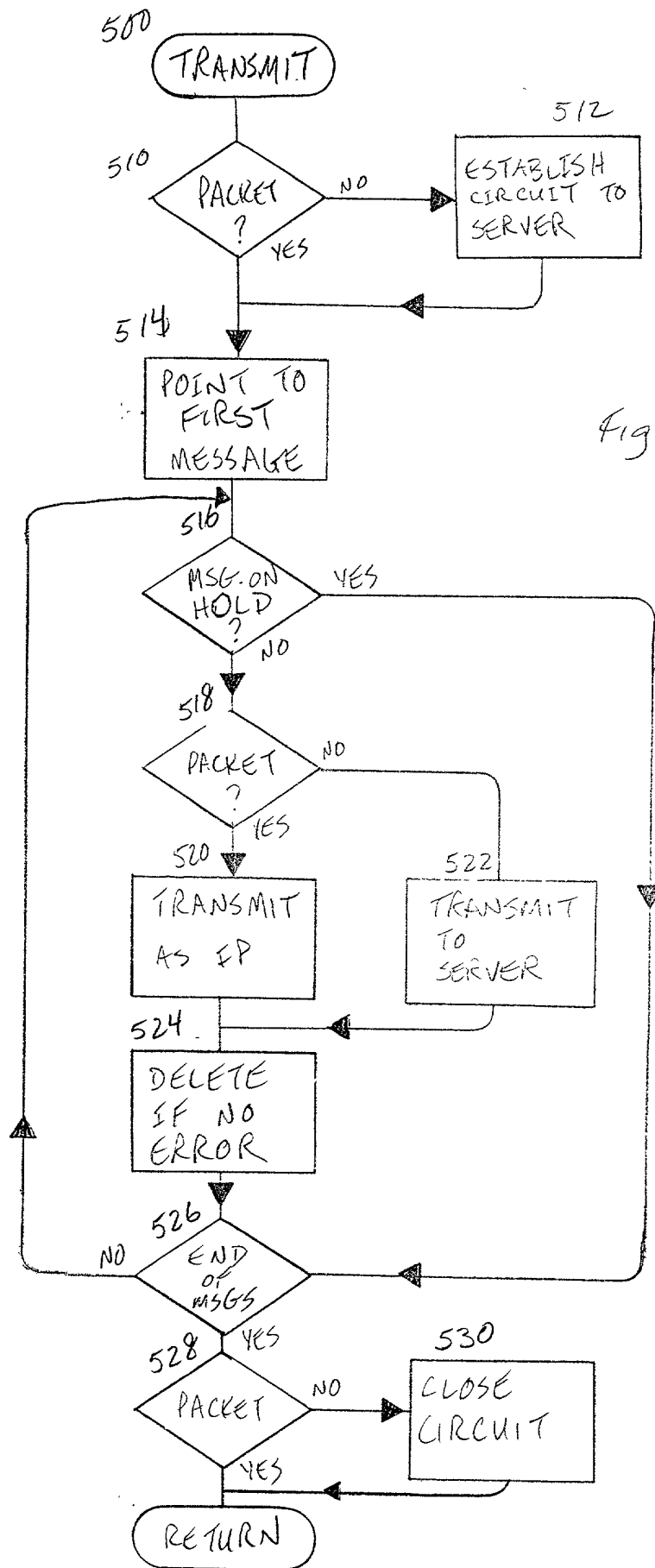


Fig. 18

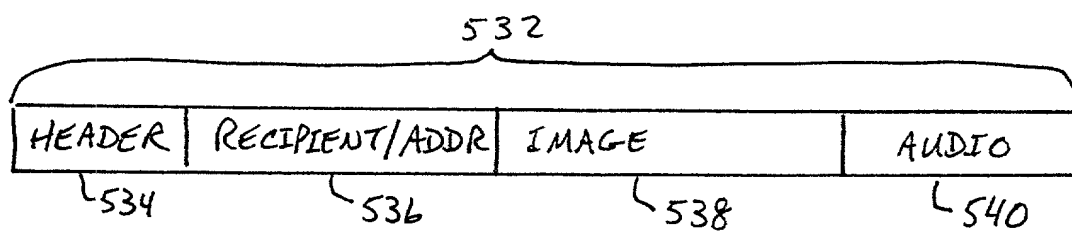


FIG. 19

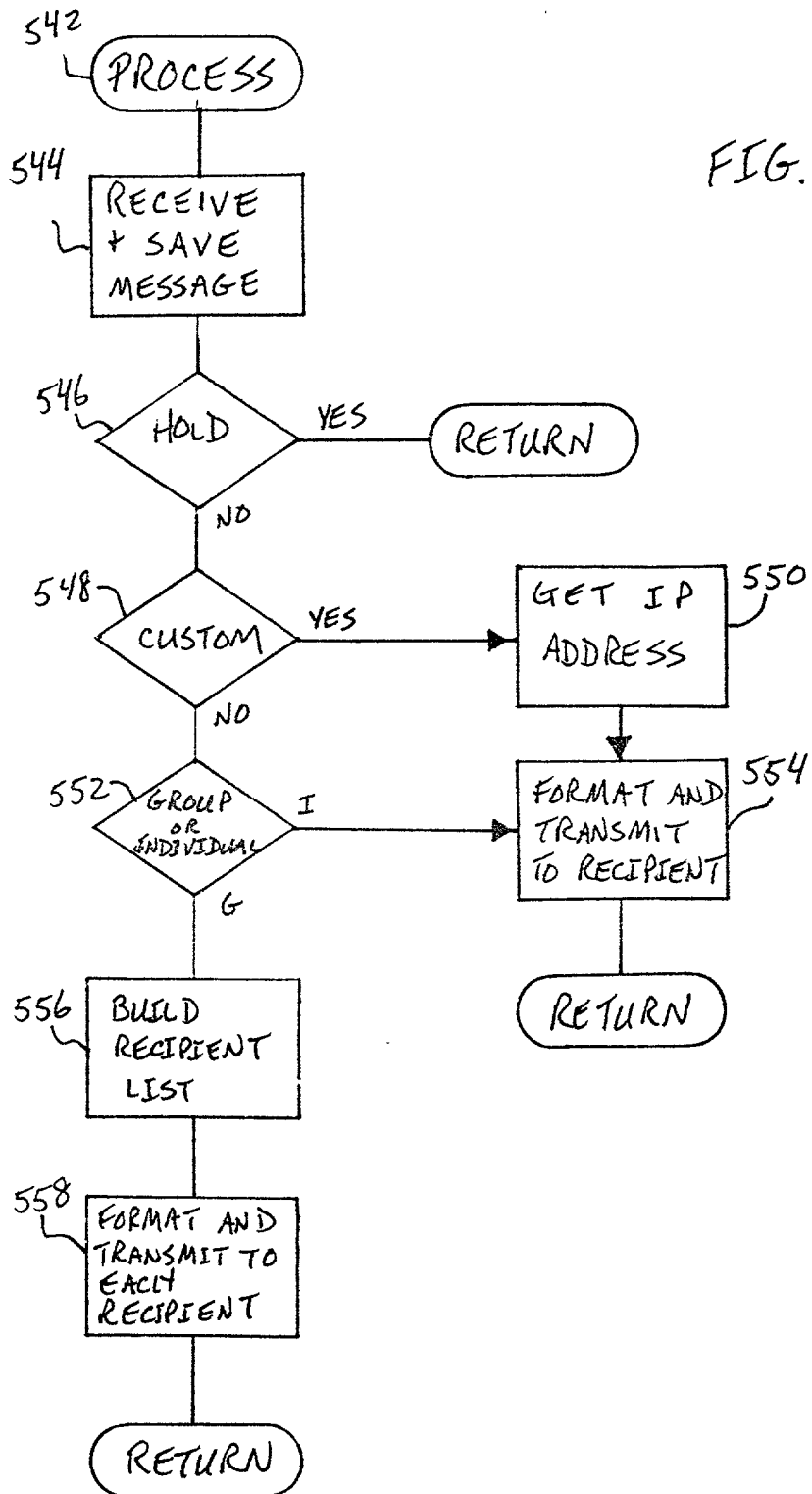


FIG. 20

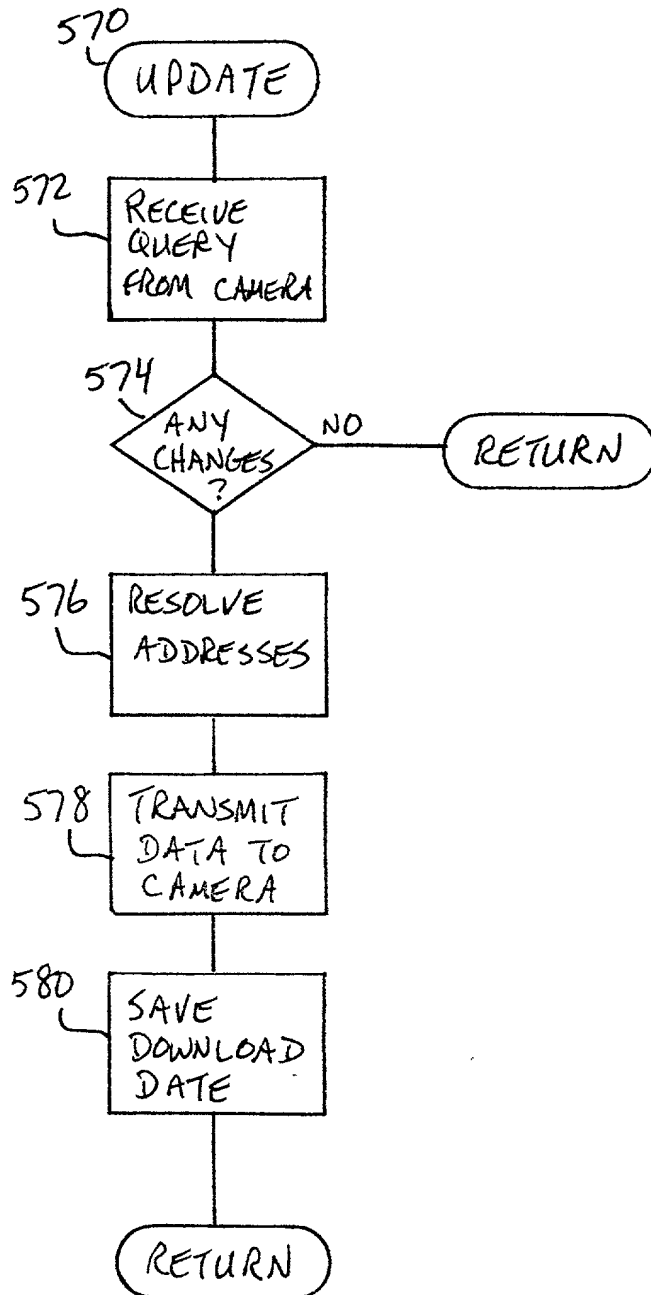
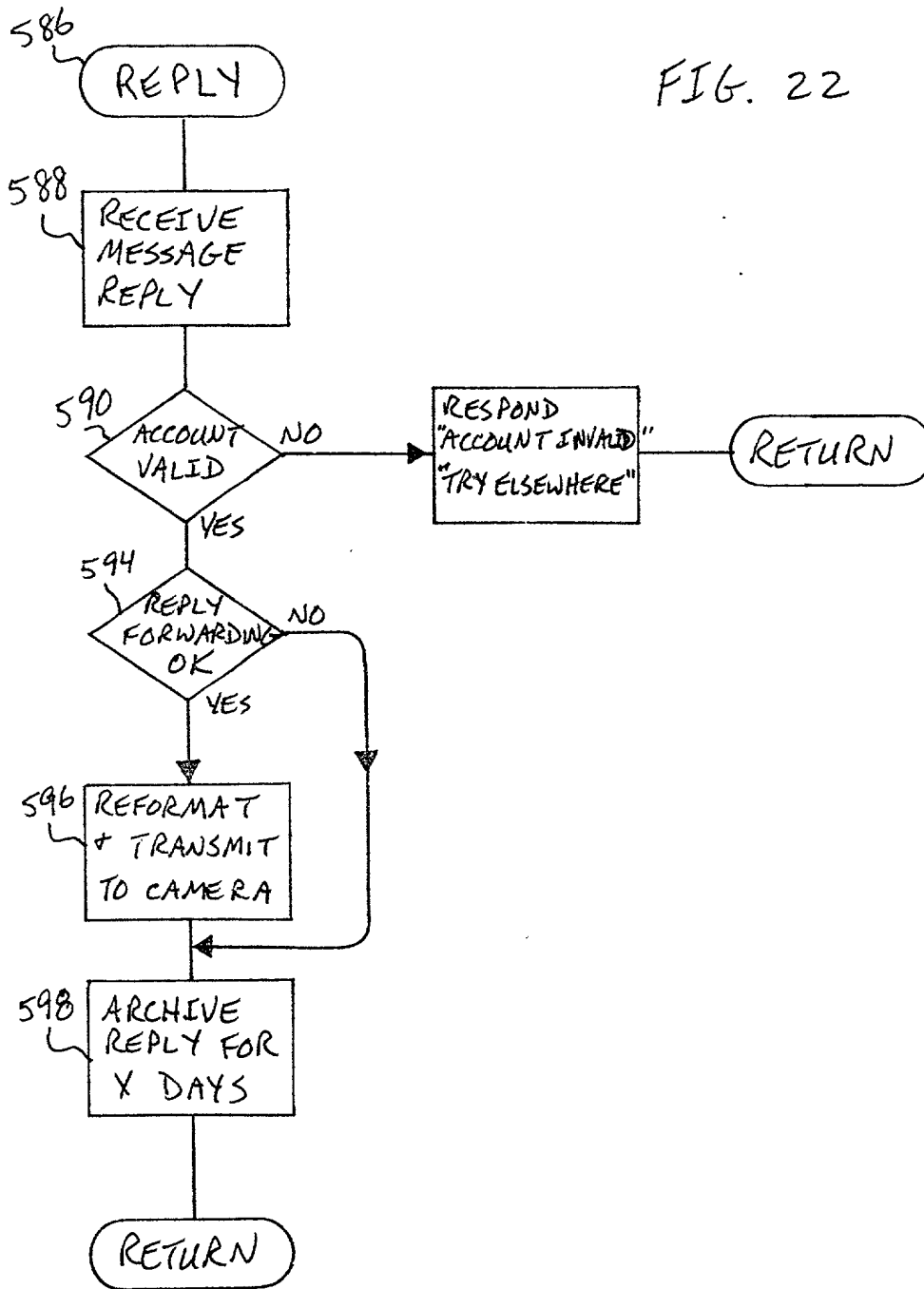


FIG. 21



FIG. 22



## DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled APPARATUS AND SYSTEM FOR PROMPT DIGITAL PHOTO DELIVERY AND ARCHIVAL, the specification of which is attached hereto, and which is a continuation-in-part of provisional application number 60/087,745 filed on 06/02/1998.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims.

I acknowledge the duty to disclose information which is material to patentability in accordance with Title 38, Code of Federal Regulations, section 1.56(a).

I hereby claim the benefit under 35 U.S.C. 119(e) of United States provisional application number 60/087,745 which was filed on 06/02/1998.

I hereby appoint the following attorney to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

**Andrew Thomas Knowles**, registration number 33,525.

Direct all telephone calls to **Andrew Knowles** at telephone no. (919) 834-3897, fax: (919) 834-3890.

Direct all correspondence to **Andrew Knowles**, 521 W. Aycock Street, Raleigh, NC 27608.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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